

# The Global Health CHRONICLES

MALARIA CONTROL: CDC BEGINNINGS

**Name: Steele, James H., DVM, MPH**

**“CDC History: James H. Steele, DVM, MPH. Interview by Dr. Peter Schantz, 1989. Atlanta, GA.”**

*Label: CDC History – Dr. Steele 2/6/1989 DVD #2011.74*

## **Summary of Interview:**

Dr. Steele began by discussing his activities in W.H.O. and his 1946 memo recommending a veterinary component for control of zoonotic diseases and food hygiene. He said integration of veterinary science in other countries' programs was sparse, originally, and veterinary medicine was tied only to agricultural economics. He doubted international work's effect because he believed 3<sup>rd</sup> world countries lacked internal support and Latin American countries struggled politically. Dr. Steele touted the worldwide impact of the chick-embryo vaccine for rabies. He found that domestic psittacosis and wild rabies problems were best solved with medicated seed and oral rabies virus, respectively. He expected the association between avian and swine flu but was puzzled that swine flu stopped transmitting to man. Furthermore, he discussed control of animal chlamydia and upgrading management of laboratory animals. He believed the future of veterinarians in public health would focus on epidemiology, changing disease behavior, radiation, and communication public health knowledge to the nation.

## **Notable Quotations from Interview:**

On veterinary medicine in public health: *“Veterinary medicine has touched on many areas in the public health service and that was my original intent to determine where the veterinarian would fit in and be able to make the best contributions to the resolution of health problems, not to veterinary problems but in public health problems.”*

On challenges to public health veterinarians: *“But talking about the problems that should face veterinarians and that should be a concern to them is the changing behavior of infectious diseases, that no disease is static. It's just like all living forms of life, they're all seeking out a solution to their existence.”*

On the value of epidemiology: *“You learn a little bit from anatomy learn from physiology, biochemistry, pathology: everything is contributing. But you got to have some place*

*where you weigh these things, and that's what epidemiology is all about. Where you bring these facts together, and where you apply a mathematical formula to determine what their significance is. There are too many people who are willing to talk any time, any place and say "I know, I have seen" but they have no idea how to correlate that with any background information, or how to make a rate out of it or how to determine how it should be pursued. And the people that teach all the way through should have a knowledge of epidemiology so they can pull it together."*

*On PH careers and future challenges: "I raise that theme: That you can have a great degree of satisfaction from a research career that is constantly bringing up new facets, new ideas, new challenges. And one, the challenge that I consider most important of all is, what is life? Where did life begin? Do you have any hypothesis of the origin of life? Or is it matter of faith that you combine with your scientific knowledge? Those are challenges that will be with you forever, I don't see any easy solution."*

### **Key People Mentioned in Interview:**

Acho, Pablo	Gray, Dr. _____	Plum, Dr. _____
Alto, Pedro	Haldeman, Jack	Renandos, Mario
Andrews, Dr. Justin M.	Held, Joe	Richardson, Dr. John
Arnstein, Dr.	Hickey, Bob	Rubin, Dr. Harry
Baer, George	Hollis, Mark	Schaeffer, Morris
Bell, Mrs.	Holly, Henry	Scrugs, John
Blood, Ben	Johnson, Harold	Shepherd, Charles
Boyd, Secretary Lloyd	Kaplan, Dr. Martin	Shinnick, Tom
Burgdorfer, Willie	Kaplan, Dr. William	Shulp, Dr.
Dean, Dr. Don	Kissling, Robert	Stafseth, Henrik
Dean, Joe	Langmuir, Alex	Stern, Max
Donahue, Dr. _____	Langmuir, Alexander	Thorp, Dr. W. T. S.
Dyer, Rolla Eugene	Law, James	Tierkel, Ernest
Eddy, Bernice E.	Lee, Assistant Secretary	Trujillo, Dictator Rafael
Eichorn, Dr.	Phil	Vigler,
Eistone, Dr. Hal	Lieberman, Dr. James	Vonderlehr, Dr. Raymond A.
Eng, Tom	Mason, Dr. Don	Wallace, Dr. Gordon
Fernandez, Emerio	Mountin, Joseph	Williams, Charles
Fuchs, Mr.	Myer, K.F.	Wolfe, Dr. Art
Galton, Mildred M.	Parran, Thomas	
Gravelle, Dr. _____	Pavlonski, Dr. _____	

### **Key Terms Mentioned in Interview:**

Psittacosis; tetracycline; Veterinary Public Health Laboratory ; W.H.O.; Food and Agriculture Organization (FAO); Pan American Veterinary Program; rabies; brucellosis; tuberculosis schistosomiasis; Pasteur Institute; ornithosis; Avian flu; Swine Flu;

Department of Agriculture; CRC Handbook of Zoonoses; United Nations Relief and Rehabilitation; hydatid disease; bovine tuberculosis; Lyme disease; keet life, campylobacter, listeria, giardia, salmonella enteritis, *Borrelia burgdorferi*, disease, brucellosis, foot-and-mouth disease, tineacide, chicken embryo rabies, Soviet Union, PL 480; cryptosporidiosis; pneumocystis carinii; cysticercosis; Rinder Pest Epizootics; brucellosis; BCG [vaccine]; tuberculosis; influenza research; panzootic pandemic; swine influenza; PL 480 funds; giardia; medicated seed antibiotics; chlamydia; foot and mouth disease; PAHO [PanAmerican Health Organization; sanitarian; Veterinary Corp; anthrax; arbo viruses; milk sanitation program; plague; *Borrelia recurrentis*; AVMA Congress [American Veterinary Medicine Association]; salmonella; pilorum; yersinia; campylobacter; Listeria; diphtheroids; *E. Coli*; food hygiene; *M. Leprae*; AIDS; cryptosporidiosis; *Pneumocystis carinii*;

## INTERVIEW



*Dr. Peter Schantz and Dr. James Steele, 1989. Photo from DVD of interview.*

**Jim, as a preface to this second episode in your career at the Centers for Disease Control and the public health service, perhaps you could give us a brief summary of the principle events in the first chapter of that story.**

Yeah. In our previous recording we have discussed the establishment of the Veterinary Corps 1947, the establishment of the program here at CDC also in 1947. It previously had been at the NI's of H in Washington, D.C. under Dr. Joe Mountin, and our initial

project at CDC was the establishment of the rabies laboratory in Alabama that became the center of our rabies control activities for a long period of time at Montgomery, Alabama and Dr. Tierkel set up the basic studies there and evaluations of vaccines. Dr. Kissling followed with studies on the reservoir of rabies and behavior of rabies in nature.

Then out of the Atlanta office when Dr. Tierkel became my deputy, he oversaw the national rabies control program. In addition to that was our efforts to control psittacosis in the beginning which was a very difficult operation because of the movement of birds. There was no way to easily control them, but fortunately the antibiotics, mainly tetracycline, had reduced the mortality of that disease so it was no longer a pressing public health problem as it had been in the 30s and 40s before the era of antibiotics.

Another accomplishment of the early days was the establishment of the Veterinary Public Health Laboratory with Mildred Galton in charge, which was established for the purpose of pursuing investigations of salmonella infections in animals that were transmissible to man, the means, the roots that followed. Also she established the first investigations of leptospirosis and other food-borne diseases. At that time we had no knowledge of campylobacter or vibrios or we had very little knowledge of Listeria except to know there were sporadic cases of Listeria. Later on we did fund the Zoonoses Center at the University of Illinois where Dr. Gray carried on Listeria studies but unfortunately he died prematurely and these studies never had the attention that they should have had in the 1960s and '70s and now in the '80s they've become important problems.

Those were the early accomplishments aside from our contributions to the international scene. Previously I discussed our activities in the Pan American Health Organization which led to the creation of a veterinary public health program within Pan American which was developed by Dr. Ben Blood and Dr. Pablo Acho who was certainly one of the outstanding international public health veterinarians and then carried on by Emerio Fernandez and now under Dr. Joe Held who was one of our early EIS veterinarians here at CDC. But today I think I'd like to pick up with our activities in WHO.

**Let me interrupt for a second. So with the establishment of the category of veterinarian in the public health service and then the establishment of the unit in veterinary public health at CDC followed immediately by some very important programs in rabies and other zoonotic diseases. Was this unique in the world at the time or were there other countries who had really blazed the trail in—**

I would say that this was unique, that no other country had integrated a veterinary program into their national health program. I have covered most of the world in my professional career and now spans some 50 years and possibly Japan we could say had an infrastructure of veterinarians in public health but they were largely in the

framework of hygiene. And it wasn't until the McArthur era in Japan that the veterinarians really came to grips with their principle zoonotic problem which was rabies and within a decade after the war it had been eradicated in Japan where previously the disease had been there, as the Japanese say, a thousand years. I can't attest to that, but the intensity at which the Japanese applied themselves they eliminated that disease as they did with brucellosis, tuberculosis, even schistosomiasis. They had little foci because they had a large infrastructure of veterinarians that were tied up with the local health agencies throughout the country.

Looking at Western Europe, France had the tradition of veterinarians working with physicians that came from Pasteur Institute and they should have accomplished a lot more. They certainly did a lot together in research. But they didn't have the tradition of epidemiology and field operations running parallel together.

Germany, their veterinary services were a part of the overall national health service, both being a part of the ministry of interior previous to the war but then after the war they were separated and the new ministry of health and the ministry of agriculture both had veterinary proponent programs within them.

**Following on that idea that if you look around the world you see some countries which have had veterinary public health programs that have been outstanding and they certainly played a role in international leadership in this area. Do you see this as a question of leadership by certain individuals or structure of government institutions? For example, what I'm mainly thinking of, you know, the roots of veterinary medicine in the agricultural field may to some extent in some countries have prevented them making that easy liaison with medicine.**

Yes. I would say that you would find that the leadership element is probably the most important thing there because by tradition, veterinary medicine became a part of the activities of ministries of agriculture in the sense of protecting economic interest. The public health aspect was there, but it was never overemphasized. Going back to the 18<sup>th</sup> century, the establishment of the first veterinary programs in Europe to protect the tax base of the countries was the way it was sold to the government. Following the big Rinder Pest epizootics of the 18<sup>th</sup> century that he wrote at the tax base from the rural areas, they had to do something to defend the income of the farmers and the nobility that owned the farms that paid the taxes, and also transportation of the horses. And you can say that it wasn't until well into the next century, the 19<sup>th</sup> century, with Pasteur and the veterinarians of his time that really began to speak about the public health function of the veterinarian. And then in the United States the man that did it most effectively and will always be remembered for his contributions was James Law, the famous Scott veterinarian that came to Cornell to set up a veterinary faculty, roughly about 1870 and had a great influence on early veterinary medicine in the United States.

But even he, as such a leading person as he was, felt that the greatest contributions of veterinary medicine was going to make was to agriculture and protecting the economic development of the animal industries and public health followed thereafter.

**Returning then to the role of the World Health Organization in development of veterinary public health, when and what were the factors responsible for the establishment of the program?**

Well, that's a matter of being at the right place at the right time. Dr. Parran who was the surgeon general in the war years was the convener of the first meeting of a group of public health experts to form the World Health Organization following the U.N. conference in San Francisco in early 1945 or even earlier than that—one of the recommendations had been that they, within the United Nations, there would be a health program following what the League of Nations had had, and the meeting in New York was due in 1946 and at that time Dr. Parran was a host to all the health officers of the world—that is the allies mainly of putting together this organization. And before the meeting there was a memorandum circulated to all parties in the public health service if they had any ideas that should be carried to that meeting about what should go into the World Health Organization program as it was to be called later, it wasn't being called that yet, we should let Dr. Donahue know and Dr. Donahue was to be the secretary for Dr. Parran and collect all this data.

I wrote a memo recommending that there be a veterinary public health component within the World Health Organization in the area for control of zoonotic diseases and for food hygiene. Both of these were carried to the meeting and I remember asking Dr. Donahue some months later, I said, "How were they received? Oh, he said, fine; nobody had any objections, some people praised them and so forth. And I always like to say that I had a small part in contributing to the establishment of veterinary public health programs within the world health organization. And the same thing occurred with the Food Agricultural Organization sometime later that year or maybe it was the following year. Lloyd R. Boyd, he was the secretary general of FAO at that time and he had a meeting here in Washington to determine what the veterinary component of the Food Agriculture Organization would be. And Lloyd Boyd was most gracious to me and inviting me to the meeting and having us participate. At the time Dr. Aurelio Malaga Alba of Peru was here visiting scientists and he came along to the meeting likewise so it added some international flavor, and it goes without saying there was going to be a veterinary component of the Food Agricultural Organization and we could tell them about what had been suggested for WHO and how the veterinary groups could carry on the liaison between the two groups, which came to be. The liaison between those two international organizations were linked by their veterinary programs. Dr. Kaplan in Geneva and Dr. Eichorn in Rome.

**You mentioned Dr. Kaplan but you didn't describe who he is and what his role was.**

Dr. Martin Kaplan was a Pennsylvania graduate, I believe 1940-41, and was very much interested in public health and during the war years was a part of the International Relief Organization, UNRI's it was referred to. The United Nations Relief and Rehabilitation Administration. And then following the war when WHO was set up in Geneva, he was recruited by WHO and became the officer for developing the veterinary public health program. My first contact with him was 1949 at the World Veterinary Conference in London and the following year he had a conference or expert group together in Geneva to review what the WHO veterinary public health program should encompass. And at that time we reviewed different diseases, one they had been asked to review by another panel, mainly his tuberculosis panel of how important bovine tuberculosis was in public health. And at that time in Europe it was a major problem that I have had American investigators that surveyed the problem in Germany tell me that one-third of all the tuberculosis in Germany at that period following the end of the war was of bovine origin in France, Italy, all these countries that had been ravaged by the war. There was a tremendous problem. On the other hand, the Scandinavian countries that had been outside the war zone, they had sent their tuberculous animals to Germany as part of their contributions every day. I remember Dr. Plum at Denmark telling me that he had set up a program to give—they had to contribute so many animals everyday to support the Germans and the occupying forces as well, as animals sent back to the Reich and he said he cleaned out the herds of all disease that he had, everything. They had tuberculosis, everything, they had brucellosis, everything, they had mastitis, went to Germany.

**It's sort of a form of scientific resistance.**

Yes, yes. It was their way of demonstrating.

But anyway, the WHO program became outstanding under Dr. Kaplan's leadership. He recruited some very fine people to carry on different parts of the world. He had a special interest in rabies so he linked up very closely with us. He also had considerable interest with brucellosis. The tuberculosis thing moved very rapidly under its own steam. The only point of conflict that we had there was the use of BCG that many—or some of the European countries, namely Italy, France—felt that BCG had a place. I, having been raised in the American custom, that BCG had no place in animal tuberculosis control; felt it was of no value and I was supported by the Scandinavians who likewise had no use for it. So in early meetings we kind of glossed over it and said

that if there was no other means available BCG might be used but within five years after the meeting even the French dropped their endorsement of it and since 1955 I believe no countries in the world have used BCG in the control of animal tuberculosis. It's been tried some places in Africa but with no success at all. But we had a nice relation with WHO. Dr. Tierkel was made available to them later on for rabies control panels and consultation to other countries around the world, and I would say that the tradition what started with Dr. Kaplan in 1950 still goes on here almost 40 years later.

**What do you see as the three or four principle achievements of that program?**

Of WHO, I think the most important that we point to would be rabies control again; that the introduction of the chick embryo vaccine that could be used and produced worldwide has been quite successful. The elimination of rabies in Western Europe has been very similar to the United States pattern except—well, you could say as the same because the wild animal reservoir of Europe has expanded tremendously with fox rabies and possibly other small animals being involved. The stimulation for worldwide control of animal tuberculosis came both from WHO and FAO; likewise for brucellosis. The parasitic studies were stimulated by WHO although there was a parasitic program that was in the pattern of the BPH program and that has moved forward but it's a difficult program to stay in place without having the social advancements needed to maintain a high level of hygiene, speaking mainly of the beef tapeworm and the pork tapeworm that require good meat inspection and good levels of human waste disposal. With hydatid disease there's been good advances by Pan American Health Organization and in the southern hemisphere, namely Australia and New Zealand by their own interest. WHO has had some interest in the Mediterranean area but how much I can't really speak to.

**The World Health Organization and the Veterinary Public Health program were very much involved in influenza research.**

Yes, yes. This began in 1956. I'm glad that you reminded me of that. This was a really big program from the world view of stimulating people to follow different directions of research. Dr. Kaplan organized a meeting in Geneva in 1956, late '56 after the Asian influenza had arisen earlier that year or the previous year to determine if there was any animal reservoir of the Asian disease or the Asian-type influenza. And he encouraged us to do work at CDC on testing the Asian strain in swine and these studies were set up at Montgomery under Dr. Gordon Wallace. who demonstrated within a very short time that swine were quite susceptible to the Asian strain but that the disease was quite limited. But the duration was not more than a few weeks and none of the animals became carriers such as had occurred with the 1918 influenza panzootic or the pandemic that occurred at that time. Because when you go back and examine data for the 1918, the evidence is quite conclusive that the disease spread from humans to

animals, swine mainly, and then swine remained a reservoir for an indefinite period—well still, you can find 1918 type influenza virus in swine even to this day where all other strains seem to have died out and disappeared.

**Do you have any speculation as to why these strains do not seem to revert to the human population in epidemic fashion particularly now that one would presume so much that the population is no longer immune.**

Well, this was a great concern of 1976 when CDC had the information on the first human fatalities of swine influenza and they cranked up for a national program, and it was widely received that this was going to occur that year but there was one thing that occurred early and that is the swine influenza stopped in April 1976. No more cases were seen and the human cases disappeared thereafter where in 1918 and 1919 both had remained at a high level or an epidemic level. To answer your question why this has not occurred, such outstanding influenza specialists as Shulp and others from Rockefeller and Communicable Disease Center and other people throughout the world had always speculated that the 1918 type would return at some future date and be the cause of a pandemic. The best answer I can give you is that there is no recombinant at this time that affects man in that pandemic behavior.

**And yet limited surveys show that people in association with the swine reservoir are infected regularly.....—**

Yeah, they have antibodies regularly and is this a protective mechanisms that's protecting all of us? I don't know.

**Jim, you've reviewed the veterinary public health programs in the international organizations. What international programs did CDC develop with other countries on a bilateral basis?**

I guess the most successful and the longest running have been those with Poland which was supported by the PL 480 funds—PL 480 funds being those that were national currencies that were used to pay for American food products and then they were deposited to be used by American agencies for the improvement of house, transportation, agriculture in these respective countries. A number of these studies aside from veterinary public health were carried on in Israel, Egypt, Yugoslavia, France, all of Western Europe you can say. But by the end of the 1950s many of these programs had been terminated and as much as the funds were exhausted; on the other hand in Poland there was a large residue of funds and we were invited in 1957 to do a review of problems first by WHO and then late in 1959 we visited Poland to determine what projects were feasible under PL 480, and this is where I outlined an international

trichinosis program that was to run under the late Dr. Gravel of Poznan and now later under Dr. Pavloski and I think the programs of some types continue in Poland. Trichinosis was supplemented later by the tapeworm studies and eventually by studies on giardia. Those are still continuing I believe.

**In fact, Dr. Pavloski, after being away from Poland for about eight years, with the parasitic diseases program at WHO is now back in Poznan and we are in the process of reestablishing those ties and working in some related areas of parasitic—**

Well, he's an excellent man to work with and with you young people here at CDC, you and the others in parasitology, I think that you can have a long profitable structure with him because Poland is an ideal place to pursue these. It's easy to get around in but the hygienic structure of the country is such that these problems do persist in a manner that is not seen in any other advanced country.

**What programs were established with the veterinary public health program in the Soviet Union?**

We never really got to having any real exchange with the Soviet Union. Following initial visits by Dr. Kaplan and Dr. Don Dean and others to the Soviet Union, my own visit in 1963, we had hoped that we might have exchange on rabies and nothing really ever developed. There was a small exchange of vaccine. There was to be an exchange of scientists but things did not go well in the '60s and '70s. Maybe now with glasnost this opportunity will come and be a new generation of scientists and the USSR and the United States can have a much better linkage than we had in our times.

**Perhaps it's timely at least chronologically at this point to return again to some disease programs, mainly thinking of the psittacosis problem and also new concepts of rabies control.**

Yes, well let's take us psittacosis. I think in the previous recording we discussed the turkey ornithosis that occurred in Texas in the late '40s and the early 1950s and through the 1950s. But parallel with that we continued to have the problem of psittacosis in birds, and there Dr. Myer, that is K.F. Myer at the University of California who was a consultant to CDC at the National Institutes of Health and the Surgeon General for a long period of time, suggested that we set up studies jointly with him and these were inaugurated I'd say about 1952 with the assignment of one of our early officers, Dr. Don Mason was assigned to work with Dr. Myer and Dr. John Richardson followed him and Dr. Arnstein followed him. And these studies were to determine the value of immunization, the value of hygiene, the value of prophylaxis with medicated seed

antibiotics. As I stated earlier, the vaccines had no success. They protected the animals against virulent disease but the animals still became carriers. Hygiene, no matter how astutely it was practiced, they still had problems.

The medicated seed offered a nice answer to control of disease and this was tried by different methods. The problem was to get the birds to eat medicated seed because most of it carried some chemical taste and so forth. But eventually Dr. Myer, working with the College of Pharmacy at the University of California in San Francisco, came up with a formula that is known as KeetLife today and is distributed by Hartz Mountain, a large bird pet supplier in this country and after almost ten years of experimentation, they came to the conclusion that this was the best way to go, and this was written into the regulations for the control of domestic industries and has worked very satisfactorily.

The international part, the importation of birds did not go as well satisfactory so far as the control of the chlamydia infection, psittacosis. But there were other diseases that were outside of the United States in pet birds, namely avian influenza, and once avian influenza was identified in these birds, this produced a problem that was outside the interest of public health; this was an economic problem and this became a very important problem to the Department of Agriculture in supervising the importation of any psittacine birds be they the small lovebirds, parakeets or the larger parrots and so forth. And today this is probably the biggest problem that still faces the industry is the movement of avian influenza. But the evidence that avian influenza was present in these birds stimulated research of a very wide character in thinking or hypothesizing that is the avian influenza a progenitor of mammalian influenza. Certainly there is enough evidence to point in that direction. Today we have to give very serious consideration to the avian reservoir of influenza, both as an economic disease and as a sentinel of public health problems.

**So the work under K.F. Myer's direction and with the input of people from CDC was directed towards a very real problem and it was recognized at the time and many of those individuals play a very important role today in chlamydia infections in general which are now recognized as a very important medical problem in entities that were not described until recently.**

Correct. Chlamydia pneumonia, the chlamydia venereal disease, the chlamydia eye diseases. There's just no end to them. The important thing is that man of these now have been separated from the animal chlamydia and when I'm speaking of the eye and the pneumonia and the venereal. Those are all human-to-human disease or human passage. The animal still remains the psittacosis ornithosis so we do have a good handle on the control of the animal chlamydia disease through the use of the medicated feed and for the turkeys they increase the medication when they do have outbreaks.

There's one other source that has not been too important in the United States and that is the duck ornithosis which seems to be a continuous problem in Europe but there's never infested this country.

**Let's discuss rabies for a moment. The early problem in the United States was dog transmitted rabies. Once it was recognized and vaccines, killed vaccines were used and were very successful in reducing the transmission, and then the problem of the wild animal reservoirs of rabies became apparent and this was a completely different problem and could not be attacked by vaccinating dogs. What were the strategies for dealing with this?**

Well, going back at the earliest vaccines were the phenolized brain tissue which was derived from the early human experimentation in India and then used in animals in Japan and then used in the United States for a decade until the chicken embryo vaccine came along and that was the first live vaccine that was used with great success. And subsequent to that we had tissue vaccines that could be denatured, and then we were coming up to the point in the 1960s, could we possibly concede what was going to be our game plan for dealing with wild animal rabies and skunk rabies across all Eastern United States; fox rabies likewise and then later on the raccoon rabies superimposed.

Well, in 1960, a young veterinary officer, George Baer, proposed the idea that we use oral vaccines. And this was a takeoff from Sabin's polio vaccine saying that the possibility did exist. I was just aghast at the idea of them thinking of an oral vaccine that might be alive and could be transmitted from one species to another, and my earlier reaction was, "Well, this isn't going to work, I don't see why we should spend any time with it."

But Dr. Bayer persuaded me that we should make an effort. And gradually piece by piece he demonstrated that this was a viable option and he demonstrated that you could immunize animals orally; it went through all kinds of different procedures of having pellets that were shot into the mouth of the fox and different bates that they would attack but I guess 1960—I think it was about 1980 that the big experiments in Europe were so successful in using chicken necks that were inoculated with an attenuated live virus and this one has won approval all through central Europe and is highly thought of in Switzerland, Germany and France where it has been most effective. We have not reached the point of putting it in the field in the United States and I am just sitting back and saying, "Well, this is one time I was really wrong," and joined Baer and demonstrated beyond doubt that oral vaccination was a viable option. And now some people are looking at it as a solution for vaccination in places like the Philippines where it's hard to come by needles and immunize dogs intramuscularly, but you can do it orally and this may offer a solution to most of the urban rabies of the world where they don't

have the resources to inoculate tens of thousands if not hundreds of thousands of animals.

**Well, we've spoken a bit about international programs through World Health Organization and with Europe. I'm thinking of the great problems of zoonotic diseases and other veterinary problems in the developing country. What activities have you had with the third world countries in veterinary programs?**

In the third world the most important thing has been to encourage countries to develop programs and to encourage WHO to assign veterinarians to these countries for a demonstration such as I did in the 1940s and '50s in the United States by assigning federal veterinarians to the state and then the states eventually taking over the programs themselves. It was very successful here and I think that it would work worldwide.

There's one drawback to these and that is that many of these countries are hard pressed in raising their own revenues internally to support different programs. And for this reason they take the attitude, "Well, we've got an international program here, it's going well. Why don't we ask that they continue with the assignment of the officer here?"

This has been done in a few areas but we're looking at the WHO people that have been assigned and FAO people that the country starts to think that they're a part of the infrastructure. They don't look upon them as a demonstration and this seems to be the most profound weakness that can be seen. I think the type of program that CDC is offering now of developing an international epidemiology EIS type corps for helping these countries is going to advance better than the WHO or the FAO programs because they're dealing with the intellectual research group of the countries and knowing what their limitations will be and they're training people parallel with those that are assigned to the country. I have been acquainted some with the programs in the Philippines and Indonesia and my reaction to those programs are that these are going ahead quite successful. But on the other hand you look at some of the programs of Latin America, you can't do anything in Peru at this time, it's on the verge of anarchy that there's different groups of gorillas that are fighting in the government, the government has lost control of many areas.

On the other hand a country like Chili, they have made a lot of advances, they've done it on their own with occasional consultation. I was in Chili last September and I was impressed they have eradicated foot and mouth [disease], they have just about eliminated bovine tuberculosis, they have brucellosis under control, they have their rabies under control, hydatid disease [Echinococcosis] under control. You would love to

say that you were a part of the demonstration that brought it to that point, but they've done all this themselves.

On the other hand, their neighbor, Argentina, just seems to go along in the same fashion except for one big advance that PAHO put in a rabies control program in the greater Buenos Aires area which has been most successful in reducing rabies from thousands of cases in dogs to almost zero today and naturally eliminating any human hazards.

**I think in Argentina we'd also have to speak positively of hydatid disease control efforts in certain provinces which, again, with the assistance of the Pan American Health Organization and Prevention Health Authorities programs were initiated in the early '70s and have progressively decreased transmission of hydatid disease.**

Yes, I think this is general, it's a very good point and there I think that the great improvement in the tenia size that they use in animals has contributed greatly to that. I was in Argentina last September and went all the way down to the Tara Del Fuego region and found that they were treating dogs there every month and they had a constant rotation. It was part of the education in the elementary schools. The health message was really getting out.

The biggest thing that I wish we could accomplish for South America because they do need a solution to the Aphthae epizooticae—foot and mouth disease problem which will allow them to send their products in World Commerce and the technology has been developed by the Pan American Foot and Mouth Research Center in Rio De Janeiro. They have come to the point where they have very effective vaccines, vaccines that only have to be used twice a year instead of three times a year. They're on the verge of saying that they improved vaccines only to be used once a year. To get that program across in South America would be probably the greatest contribution that North America or the United States can make to economic advancement of Latin America. It would be much more than contributions for internal development or worse yet the large amount of funds that go into South America for military equipment that as far as I can see is never used except maybe last week in the Revolution of Paraguay and I don't know whose equipment that was but I think it's so wasteful to use aid for destruction when we could be advancing the economic and social structure of these countries by eliminating an animal disease that is looked upon as economic calamity when it does occur.

**Jim, the first 20 or so years with the—25 years with the public health service, your activities were mainly focused at CDC in building national and international programs from that point. In 1968 you became the assistant surgeon general with broader activities. How did that change your activities?**

Well, it brought me into the Washington world in a much more real way. The problems and contention that were going on at that time, that there was great concern about the management and handling of experimental animals. Dr. W.T.S. Thorp, who had been brought to the NI's of H in 1948 had developed a good program and Dr. Hal Eistone had followed and then there had been others that were active. But at that time the pressure for humaneness in the handling of experimental animals had become a big national issue and that regulations or laws had been passed by the Congress for upgrading the management of experimental animals. I remember we had to develop the guidelines for the use of experimental animals and this was done by a joint inner agency committee in Washington which Dr. Thorp, Dr. Eistone, myself all had some input. And then these same guidelines were adopted by the American Public Health Association guidelines for agencies in health.

But there was a demand for even higher levels of management or humaneness that required there be inspection of animal facilities and this became a problem that I was concerned with. In fact, I was told by the assistant secretary, Phil Lee at that time, that this is an important problem that has to be resolved and not to embarrass research workers and so forth. And at that time the contention was that we should have a large force of inspectors across the country looking at how experimental animals were being handled, managed and used. I would subscribe to the acceptance of this responsibility of saying that we could operate such a program in the public health service but there were people in the service at that time that said, "No, we don't want to be inspecting the work of research scientists and intruding on their activities which they assume that if we were looking after the management of their experimental animals would be intruding on their research."

So the inspection of animal research facilities then went to the Department of Agriculture where it is under the APHIS Administration. This one still is a very difficult one and has not been resolved to the satisfaction of everyone concerned, and my own feeling is that I believe that a corps of public health veterinarians either under the National Institutes of Health or possibly under Food and Drug Administration where they have much responsibility for supervising drug production without getting into the research could be a very effective program. My own feeling is that agriculture feels that this is an unnecessary operation on their part or it doesn't reflect their philosophy of helping the producer—that is the farmer, in producing better animals for economic purposes.

**Certainly after your assumption of responsibilities as assistant surgeon general, you retired from the public health service.**

Oh yeah, yeah. Well, I was 30 years. I had been supported by the public health service from the time I graduated—

**Time flies when you're having a good time.**

Yes. I did my internship and then I received a PHS Fellowship to Harvard and then they assigned me the Ohio Health Department for an internship of some 18 months or so and then I was commissioned as a sanitarian for what, 2-1/2 years and a scientist for two years and established the Veterinary Corp and then all I can say is it was a great, great career. People always ask the question, if you had to do it over, would you do anything different? And I said, "All I would say is try a little harder."

There were many things I felt that I should have been able to do more with but I wasn't—one point that we've forgotten here, they had so many different people in the public health service. One of my early philosophies was I was not going to involve a large division of veterinary public health but we were to bring veterinary officers or veterinarians into the public health service and assign them to different activities. And this worked very well. Dr. Art Wolfe who later became an assistant surgeon general, he was brought in first assigned to a state. He worked on salmonella and brucellosis in Michigan in the 1940s.

Then we had a problem erupt of anthrax in a carpet industry and this was traced to imported wools and hair coming in from different parts of the world. And Wolfe went out to deal with these most successfully and then became a specialist in the area of occupational medicine and then he went on to get graduate training in radiation medicine or radiology and the application of that at public health, and eventually became the assistant administrator for the agency that dealt with the environmental impact before EPA was established. He retired in 1972 as an assistant surgeon general. So he had a very outstanding career and is still looked upon as an outstanding environmentalist today. Dr. William Kaplan was another one of the young men that came in about 1950. Dr. Kaplan had been in Mexico on a foot and mouth disease program and then he heard about ours and he came to us and said he'd like to get in and he was assigned to state activity for a while. Then people in mycology said, "Well there's an important aspect of animal diseases in connection with our work and we'd like to have a veterinarian that could develop a competency here."

He then was assigned with Dr. Jellone. He became, I'd say, one of the leading veterinary mycologists of the world and he was recognized this past year in 1988 at the World Mycology Congress in Barcelona, Spain with receiving the Lucille George Award for outstanding contributions to mycology in the underworld scene. Another one was Dr. Harry Rubin. He came out of Mexico and he went to the rabies laboratory and he

isolated some unusual strains of arbo viruses as well as chlamydia strains and he was gung ho for doing bigger things in research. He left us and went to Cal Tech where he worked for a number of years and they felt they needed a Ph.D., they said he was ready for a university assignment and went on to become Professor of Virology at the University of California at Berkeley.

We had many young men that went on to make great careers independent of CDC. Some went into health, this work here of health education I guess you could say audiovisual and that was Dr. James Leiberman who came to us first on a milk sanitation program. Then he was brought in here to CDC to develop health education materials for the zoonotic programs and eventually he came into the audiovisual program and became the director of the division and his retirement he likewise became an assistant surgeon general. Veterinary medicine has touched on many areas in the public health service and that was my original intent to determine where the veterinarian would fit in and be able to make the best contributions to the resolution of health problems, not to veterinary problems but in public health problems.

**Certainly at the time that you were initiating your programs there were some very important public health problems that the nation faced that clearly had an animal reservoir and animal component that required veterinary skills. It's been discussed within the veterinary epidemiologist circles recently that to some extent we've done a very good job and it's resulted to a certain extent in working ourselves out of that job that had been defined in the '50s and the '60s. How do you see the changing role of the veterinarian in public health in the United States at this time? Is there still a place for the veterinarian in public health as a veterinarian?**

Yes, I think so. I think that the veterinarian is trained in the same way a physician is on a very broad basis of anatomy, physiology, pathology, chemistry, virology and the political sciences. And the only difference between the two, the physician and the veterinarian, are their clinical subjects. And when you remove the clinical subjects, they can look at public health in the same broad way that other scientists do or the Ph.D.s who are specialists in so many different areas.

But talking about the problems that should face veterinarians and that should be a concern to them is the changing behavior of infectious diseases, that no disease is static. It's just like all living forms of life, they're all seeking out a solution to their existence. In my teaching at University of Texas School of Public Health, I say they're just like human beings, they're seeking social security. They want a niche someplace that they can live out their lives and not suffer with the problems of old age or starvation or degradation of the empire, etc.

A couple of problems come to my mind—or illustrations I should say. One that K.F. Myer brought to my attention many years ago when we used to talk about plague, the limitations of a *Yersinia pestis*. Why is it only confined to the Western United States? From an ecological point of view that has not certainly been resolved successfully. I know of no good hypothesis that says why does the humus latitude in west central Texas become the line of demarcation between plague occurring in west Texas versus central Texas or east Texas and why does that line extend all the way north through Oklahoma, Kansas, Dakota's and nothing is ever seen east of it, and why the limitation of plague in Alaska when you get into the cold climate or rather Canada where on the other hand plague has been known to be rampant in Manchuria and Siberia which have similar climates?

All of these things are of ecological importance and public health importance in another sense at why diseases limit themselves. But then also why do they change their behavior and seek out new hosts, a new way of life, a new lifestyle? What's happened the last 20 years in the western United States is one that I would have certainly like to have seen more—seen veterinarians participating in and this was a study of plague in dogs and cats. Well, first it was coyotes and other incidental animals in the wild western United States. The identification of plague in coyotes opened up the idea that we should look for another candidate and then the episodes in the domestic cats, feline pets being the source of human disease. All these certainly are veterinary problems in the sense that the practitioner that encounters a cat with pneumonia has to think in terms of plague nowadays and think of a virulent disease that may affect him or his staff or he may disseminate it to other cats in his practice aside from the public health responsibility.

On the other hand, the dog develops plague antibodies but no disease. A sentinel animal is very nice but why these differences? These kinds of investigations have been curtailed nowadays that nobody is really pursuing them in light of such major problems as AIDS. There's hardly any funds left over for other things that have been with us for a long period of time.

Asking these questions down through South America last August/September I find that plague is hardly recognized any place. In Mexico they say that they haven't seen it in years. Peru, where they had it as a disease in Lima and the seaports there 40-50 years ago, has not seen it in a long time. Certainly they haven't cleaned up their hygiene. Their dogs and cats are still there in large numbers, the fleas are still there.

There are cycles of disease going on that nobody is really pursuing and I feel that the veterinarian would be ideally suited to pursue these types of studies because they do have an involvement of many different animal species and then they reflect on the kind

of pathology that is seen in different species and what their susceptibility may be. That's an old disease.

A new one; look at Lyme disease. Now, *Borrelia* has been around for a long time. It was one of the original quarantinable diseases. *Borrelia recurrentis*, a human-to-human disease that was carried by lice and I guess fleas as well but mainly lice as described in the literature. This one has declined steadily most of the century and is no longer a problem of the displaced people. Even after 1945 it never became a problem. And there's so many different *Borrelia*'s on the world scene. In the United States we've encountered the cabin fever outbreaks of the Rocky Mountains that have been attributed to *Borrelia* of rodents. But with this Lyme disease, Old Lyme appeared on the scene in 1974 in New England. We weren't sure if we had a disease that was infectious or chronic or what the etiology might have been. And a CDC officer worked on it for awhile after I left in 1972-73. He published on it and the transmission of Lyme disease to dogs and how it affected dogs. That work was completed by 1976 and hardly received any attention and now ten years later, 12 years later in 1988 at the AVMA Congress in Portland this past summer it was reported that not only dogs but many other species have Lyme disease and that ticks may not be the only route of transmission. It was pointed out by a young veterinarian here at CDC, Dr. Og that the organism, the *Borrelia*, can be passed in the urine of dogs, and people from the University of Wisconsin were reporting a large number of cattle, milk cows in Wisconsin were carrying antibodies. Now the thing that you've got to sort out there is which *Borrelia* are you talking about, and this calls for some sophisticated laboratory resources. I know they exist at Yale. Willie Burgdorfer at Rocky Mountain Laboratory and Dr. Angst here—Dr. Eng, his name—

**Tom Eng, yes.**

Tom Eng. About the only resource persons I know in the United States are really giving it attention and this—if it wasn't for AIDS, the press could report that hundreds of thousands of cases of Lyme disease are occurring in the general population, not the population that has some peculiar lifestyle problems but just the average guy that goes out and plays a little softball or takes his family out on a picnic or just goes motoring and goes walking in the woods. They're all subject to Lyme disease and what the long range manifestation is going to be, like my feet being numb is a form of Lyme disease that I missed earlier in my life? I really can't answer that question. But the arthritis, the cardiopathies, the neuritis and neurological signs that are being identified with Lyme disease make this a big event and I think that the veterinarians would have a great

opportunity in pursuing this further and thank gosh that people at some of the universities are doing it.

**So you've defined as one of the continuing areas in which veterinarians are required on the public health is new approaches to old problems, approaches to changing problems—**

Changing the problem.

**The zoonotic diseases. Are there others where you feel that veterinarians—**

Well, look at the salmonella enteritidis. This one acting just like pilorum. Is it true that this organism is being distributed through the ova, coming out of the ovaries of chickens. This is almost a repeat of evolution of disease that occurred at the beginning of the century. A lot of people don't realize that if we hadn't brought pilorum under control we would not have the poultry industry that we have today of some five billion birds being processed annually in the United States. I know when I was a young person that spring chickens, they occurred in March and April and that was the end of them. The rest of the year they were growing out to be bigger birds and so forth.

So here you have something of histopathological evolutionary epidemiologic problem that's laying itself out in front of us. What's happened with campylobacter? Unknown before 1959. A new strain of vibrio. Look at yersinia. It recedes in animals, goes and comes. All of these. And then right now this big rowel over Listeria of how many strains are there of listeria? How many are pathogenic for man, how many are for animals, and what are their characteristics of survival. All these are still epidemiological problems that need good microbiological backup, and then beyond that look at the viruses that are constantly evolving. What's the interchange between viruses and man and animals and insects? The vesicular stomatitis that we raise the question, does this have a plant reservoir as well as an animal reservoir? This calls for people outside of veterinary medicine that make their contributions.

I look at the challenges of the new century saying that all of them are going to call for all the resources of the biological scientists and when you think about what the effect of radiation is going to be, because everybody has this great fear that we turn loose something that we can't control, that we need the consultation of the physical scientists, and then to try to explain that to the public we need the assistance of the social scientists. Right now I've been very active the last few years with the issue of antibiotics and animal medicine. Are we creating a new public health problem by this

constant use of antibiotics. And I say look at the other side of the coin. If we didn't have antibiotics in animal medicine, how many diseases would be rampant? What would happen with many of our highly susceptible gram positive, anthrax and the aero syphiloid. All of these might be rampant to the degree that they would require full time attention and we wouldn't be uncovering some of the other problems. But my own feeling is now with antibiotics, and I wrote it in 1968 for the National Academy of Science, yes we do have a problem here because I remember what happened with milk and penicillin, and we should do everything to keep it out of our food chain, but at the same time we have so many advantages that we attribute to the antibiotics in animal medicine that we balance these off against each other and when I look at the bottom line today I don't see, after 30 years or 40 years, 1950 that we first started discussing this, next year it will be 40 years and I can't see any evidence that there's been an increase in mortality in humans due to the misuse of antibiotics in animal medicine. I won't speak to the other side.

**Permit me to add a few examples from parasitic diseases of emerging zoonoses. Certainly Giardia which when I studied parasitology was considered to be virtually a commensal of the intestine, has now emerged not only as the most common cause of water-borne outbreaks of disease in the United States but a major player in diseases transmitted within day care centers. Now, the importance of animal reservoirs became apparent first in the investigation of the community water borne outbreaks in the role of beavers and muskrats was quite well defined by studies done here at CDC. The role of animals in transmission in the community through contact with animals remains to be defined and this will require laboratory work determining which strains are capable of infecting people.**

Well, that's the Giardia strain.

**Yes.**

Because the matter of strains in Giardia has bewildered me. Houston, Texas where I reside now where I'm a member of the faculty, where people call me up and ask me a lot of questions; we know we have Giardia in our water supply, the city water supply, but we have no disease that we even associate it with it except the child care centers. But we're not sure that that's the genesis there. On the other hand I have the veterinarians tell me they see a lot of Giardia in their practice and the owners frequently say, "Now is this dangerous to me? I read about it someplace."

And they say, “Well, practice good hygiene, make sure the animal is treated and so forth, let me check every three months, six months, whatever the time may be,” and they never have any stories or any tale. And then the one that confuses me worse is the pet farms that we have in the—beyond suburbia of the cities where they’re raising different breeds to be sold in the malls, and these places are teeming with Giardia and they treat themselves. They’ll tell you that Giardia is their biggest hygienic problem. And they send them into the malls, they send them into these outlets and again, I never heard of any stories where these animals are responsible for any human disease. They certainly make the puppies look unwanted, if I can use that term.

**We did a survey of pups in pet shops in the Atlanta area several years ago and found 42% of pups up for sale to be infected with Giardia. There was no correlation between symptoms and the presence or absence of Giardia. So clearly the pups were carrying this and had some degree of immunity so they were not ill themselves and we were really unable to determine exactly what is the public health significance of this for the reasons that you just—**

I don’t understand. Another one that’s of lesser nature, and I had a student write a thesis on this 15 years ago, yersinia in dogs, and dogs and rats in the greater Houston area that we could find enough yersinia certainly indicated it should have been a public health problem but human disease was only associated under the most impossible hygienic conditions. And you ask about this problem of Listeria in hospitals and so forth. Some people come forth and say, “Oh yeah, we have a lot of Listeria.”

Then you go back to inquire further and say, “Well that’s a matter of the laboratory, they’re not sure if it’s Listeria or streptococcus B or diphtheria organisms.”

And I say, “Well, can’t we sort these out better?”

So in this sense this is much like the vibrio—the campylobacter situation of the 1960s. Up until 1970s it was near impossible to make an easy diagnosis of that because of the procedure you have to have a modified oxygen atmosphere in your bacterial outer plates. I don’t know enough about the complications of diagnosis of the Listeria, diphtheroids and the strep B.s, but some of my students tell me that under the microscope you can’t tell any of the differences and you’ve got to go to the selective media and go through a much longer procedure to define what you’re dealing with.

**Jim, what other problems do we face in the United States today in which veterinarians may have some unique—**

Well, I think the one that you’re going to have the most concern with is radiation of animal tissues; meat, poultry, sausages and so forth. To control the problem with the

salmonella problem, I'm not talking about this salmonella enteritis of the eggs but thinking in terms of the surface contamination. You've got to look at campylobacter and salmonella and the E-coli all being equal as source of the contamination. And no matter how you look at all this, you can watch it, and we did these kinds of studies 30 years ago when Galton was operating our laboratory, we did studies on the flow of water, we did chlorination and different levels of chlorination and other germicides to the moving bacteria from the surface. And they were all effective to a certain point and you could come to the conclusion that a lot of clean water was very good but you still had a few left.

And then when we carried out the project, I had a public health officer assigned to Massachusetts to determine what the salmonella fluoride products were and day one was zero, day two most of the time was zero, day three a few colonies, and then from then on you had exponential increase in the numbers and within two weeks you had—if you kept the product there, you wouldn't keep the product that long—you had enough salmonella there to produce an epidemic. Now those were clean. They were zero when they came out of the processing houses. They'd been cleaned by a lot of water but there was still some remained.

This problem comes up all over the world. The meeting in Geneva last December was on radiation of meat. The environmentalists of Europe, mainly the Greens, are dead set against it. They say this is contamination. Same thing as they're arguing about hormones in American meat that is another form of contamination even though it's natural hormones. The intent is to keep down the fat and so forth but they're dead set against it. I think this is going to be one of the most important areas of activity on the part of veterinarians that are concerned with food hygiene of demonstrating and explaining that this does not produce any health problems. I'm sure that if I'd had the same type of opposition that exists today to radiation about antibiotics in production of animals that we would have never got to this point of using antibiotics so widely and successfully as we have. I look upon radiation as one of the biggest challenges of public health officers no matter what their discipline is or professional category. We have to resolve this problem and point out to the public that this is a very safe procedure. Look, we use it today for all our medical instruments, we use it for all our medications. I guess you were here 20 or 30 years ago when EIS was investigating these different outbreaks of salmonella and enteric diseases that were traced to medications. We had these in the sugars and salts that went in the compounding medicine. Today with radiation that no longer exists. We've got sterile products, we know they're sterile, we know the instruments are sterile, we know the needles are sterile, we know the fluids are sterile. All that is a dividend of radiation, and we can apply that to food if we can educate our public to acceptance. But right now most

people, even the people that are the big processors back off and say, “I know there will be no acceptance,” and so forth.

**I understand that problem. You were talking about a problem of public education in a very—**

Well, I think the new director of the World Health Organization, a doctor from Japan, a psycho-pharmacologist, in a number of his speeches has pointed out that the most important public health challenge for the next century is going to be education, communication and understanding what public health is about and what it can do for you.

**Jim, since you left the Centers for Disease Control you’ve been Professor of Environmental Health at the University of Texas School of Public Health. What have been your major activities?**

I think one I point to and say that has occupied a good deal of my time is the compilation of the handbook of zoonoses, the CRC in eight volumes. This actually has a genesis of my relations with K.F. Myer. When we were winding down the psittacosis studies and the plague studies, I came into the plague at the very end, and he was always telling me about things that I should bear in mind and keep in perspective for future studies. I said, “Well, what we should do is put together a series on zoonoses, so with your historical perspective and my current access to information we could do this in a real way.” And we started talking that way, 1967-68. Well it was talk for five years and then I retired in ’71 and we’d visit on the telephone and he’d say, “Well when are you going to come out and see me?”

Then I got tied up with his 90<sup>th</sup> birthday celebration putting together the issue of his fest script was to be a big event in May 1974 in San Francisco. So ’72, ’73 a lot of effort went into raising the funds for that because ...raise what I thought was a lot of money, \$12,000 at the time, and get a coordination of all the papers and that part was easy because K.F. could edit it. Getting the funds were a little more difficult. But a fellow by the name of Max Stern and I’d gone the whole circle of all the people that K.F. had worked with for many years and I was getting like \$200 here and \$500 there but I wasn’t getting the \$12,000 that the University of Chicago wanted to put out a special issue of Reviews of Infectious Diseases that would be devoted to K.F. Myer. And Max Stern, who was the chairman of the Harts Mountain Company that we had worked with cooperatively in resolving the psittacosis thing and the antibiotics in feeds, said to me when I told him what the story was, he said, “Jim, K.F. is of such importance to me and to my society, that is thinking of people of his age group”—he was in his 70’s himself—

he said, "I'd do anything to support him. He says, if you have any problem paying the bill, just send it to me." We've raised \$3,000 and picked up the rest of it and so forth.

Well, anyway that was a great event and we were to have a great show. K.F. was enthused about it and we were going to have a big party in San Francisco. K.F. had more or less dictated that the men will have one party at the Family in San Francisco which was his favorite club, and the ladies would have a party at one of the big hotels. Well, the women screamed that they didn't want any part of that and I was caught in the middle on that. People were saying, "Well can't you convince him to do it differently." And he and I were on the telephone frequently.

Then he became ill February of 1974. He told me, he said, "Aah, cancel that whole thing. You don't have to spend that kind of money on me. We got many social problems that need it more than giving a fest script for me."

And well, I thought he was just being hard to get at first but then as I talked to other people, they said he's not doing well. And then he was hospitalized sometime in March and they did some blood counts on him and they saw that he had anemia and they came to the conclusion he had some type of internal bleeding, very similar to the Emperor of Japan that just died. Pope Paul or Pope John died the same way. And then he was hospitalized—well, he was in and out of the hospital. He wouldn't stay there. He said, "Aw, those guys"—and he was complaining that his wine didn't taste any good and his pipe was worse and he was bloated. He knew what he had. He had a colon cancer. And he went into the hospital about mid-April. He gave his last lecture at the medical school the first of April or thereabouts with great enthusiasm. People said he behaved just like K.F. And he went in and then the word came out that yes, he had colon cancer and it was inoperable and all they could do was think how to make him comfortable. And I was on the telephone calling the hospital periodically and I get a telegram Saturday night delivered like midnight, the last Saturday of April 1974 that he had died just a few hours earlier.

Well, that changed things completely for celebrating but what it meant was, let's get this book done, and that's when I became very serious about the CRC Press, that they had been asking me to sign a contract and not immediately but I took to—I called them and I told them what had happened and that I wanted to move ahead on this book and we signed the first preliminary arrangements that summer 1974 and we were in gear the following year of cranking up, getting authors and contributions. Well, I look back at it now as 1974 to 1984 I was occupied with that book ten years and I'll say that this is my most important contribution in my post public health career.

**Jim, throughout your career you've been recognized by many individuals, by many institutions. Can you tell me what has been the most satisfying recognitions that you can recall?**

Well, naturally I would say the first would be the Public Health Service receiving their Distinguished Service Medal on my retirement and the escrow that went with it and so forth. That certainly would be my number one. The Brachman which was the APH, the American Public Health supported by the Brachman funds that was a vote of all the APHA and that certainly would stand very high with me. And then those that I received within veterinary circles. I have cherished all them I've gotten from my university and I've gotten an AVMA in other groups.

The, I spin outside of that and then I come into the associations that I've been a part of, American Society of Tropical Medicine, APHA their Centennial Award, all of these have meaning in a different sense. And then this past couple of years I've been a recipient of many—of two very important, or a number of different international awards. But one that gave me a great deal of satisfaction was the German government giving me recognition last July 1, 1988 and that—here I am, one that opposed Hitler from day one; I just couldn't stand the idea of a dictatorship that was going to make the world safe for Arian people. I had been approached when I was a student 50 years ago that I should go to Germany and be a part of this new Arian culture. On the other hand I've been tugged by the far left and saying, "Oh communism is the way of the future, socialism will lead us all to a better life."

I'd say one of the more difficult things you'll find in life is being a moderate of determining what is important, what this man on your right is saying, what is important with this man on the left? And what is radical and what is bizarre and what is destructive, and finding a course in between. Well, the Germans recognized me for that because I had condemned them widely in some of my writings at the end of the war and the way I spoke about them, and then later on they asked me—1955 it was already—to consult on their problems. And that, I did in a very objective way and I always gave them my criticism of what they had allowed their country to do to the rest of the world, and then last year they gave me this recognition for my contributions to the development of international health and progress in the sense of humaneness to human beings. Sometimes maniacs are more concerned about animals than they are human beings. To me human beings come first.

**Jim, we've looked back a long ways. Let's look into the future for a moment and just speak to the veterinary student of today who is faced with a \$15,000 annual tuition fee, expenses and the prospect of perhaps questionable future in terms of private practice in traditional areas. What do you tell veterinary students?**

Well, I still feel great enthusiasm for public health and research careers in public health, or those that are related to public health that can be funded from our NIH grants or NFID grants or even Department of Agriculture, which are limited. But to me as I've gotten to know many practitioners over my life and spent time visiting with them, sitting and having a meal with them, talking over a drink, and they've all—their comment uniformly has always been, "What a wonderful life you've had, what an exciting life—you're at the cutting edge of research here, you have the sense that you've made contributions, as you look back on your life you say you've really left something behind."

And they all say that "Yes, my practice goes well, I made good investments, etc., etc., but do I have what you have?"

Now, I don't use that in a lecture but I raise that theme that you can have a great degree of satisfaction from a research career that is constantly bringing up new facets, new ideas, new challenges. And one challenge that I consider the most important of all is what is life? Where did life begin? Do you have any hypothesis of the origin of life or is this a matter of faith that you've combined with your scientific knowledge? Those are challenges that will be with you forever. I don't see an easy solution.

But getting back to the practicality of what—I guess we go back 25 years when we first had sessions with deans around the country on how we should teach public health in the schools. And we'd always had the tradition of little meat inspection, little milk inspection and maybe somebody added a few words about poultry inspection, maybe somebody said something about dog control. Well, I said these things are all very important. They should know something about it sometime or another that they can answer questions, but to me the genesis of why they do this, this is important. And this is things that you learn as you go along. You learn a little bit from anatomy, you learn physiology, biochemistry, pathology, everything is contributing. But you've got to have some place that you weigh these things and that's what epidemiology is all about, where you bring these facts together and where you apply the mathematical formula to determine what their significance is.

There's too many people that are willing, that talk any time any place and say, "I know, I have seen." But they had no idea how to correlate that with background information or how to make a rate out of it or how to determine how it should be pursued. And the people that teach all the way through should have a knowledge of epidemiology so they can pull it together and then by the time that you reach your senior year you have an elective called epidemiology or you can have an elective as epidemiology as you're going along to try to bring all these things together and give you some explanation of what all the science is about and what it means both to the clinical patient you'll be dealing with, what type of medications you'll be using, Chi square, what the values may be and then what the overall problems are. And I would say this. He had a romantic

way of doing it. And then if they want to go on and have a career, then go on and get your graduate degrees, be it the MS, MPH, Ph.D.s, whatever you want because anybody doing anything in size today knows that they have to have something beyond our clinical years.

**Jim, I think we've covered a lot of ground. Is there anything else that you would like to say to finish?**

Well, I speak to my students frequently, or when I'm invited to speak at different universities, and usually freshman class but other times all the university, and I like to dwell on what happened in 50 years, how rapidly 50 years has gone by. But then the enormous advances that have occurred, and I say when people are saying that we have problems, look at the bottom lines. What's the bottom line? Social Security. Why are people living longer? My own lifetime. When I was born in 1913, my life expectancy was slightly over 50 years of age. Here I am, I've exceeded that by 25 years, by more than half of what they told me I was going to have. And I'm sure this is going to occur to you, that you're going to see changes in your 50 years that are going to change and that are going to determine what the social security policies are going to be. "We may not be able to take care of all the things that we've outlined and say these are the right things, but I'd just like to leave this thought with you. Where will you be 50 years from now? What will you be doing? What will you have contributed?"

**Great.**

**Bacterial disease has never been clearly defined as a zoonoses thing and for which there weren't any good animal models as recently yielded some of its secrets with regard to the armadillo as an animal model and perhaps an animal reservoir. Have you been involved with that work?**

Yes, I have a friend who did that for more than 20 years. You know, this goes back to reports from southwestern Louisiana about 1968-69 that a graduate student there had been able to inoculate armadillos successfully with *M. leprae* and this was her master's thesis and this attracted a lot of attention. And then we had people in the field looking at it and oh, for about five years this was largely confined to laboratory work and in 1974 a student at the University of Texas School of Public Health asked me what I thought about the parents of leprosy in feral or wild armadillos in Louisiana. I said, "Good lord, how do you mean, has it escaped from the laboratory?"

That was my first reaction, and that was my reaction for a number of years even though there was more reports of recoveries from armadillos in the wild. And the story kind of meshed together that there had been an accident in the laboratory or that some wild ani—that some armadillos had escaped, but I never could get it straight until Charles Shepard, who was head of the special pathogens laboratory here at CDC which included leprosy, came out to give a talk and we honored Charlie with our honorary diploma, the American Veterinary Epidemiology Society, and I asked Dr. Shepard, I said, “Is there any relation between the *M. leprae* being found in armadillos and that’s isolated from human?”

Oh, he says, “They’re the same. The DNA probes don’t show any differences.”

Well, from then on the complexion of things changed and then we had one colleague at Galveston, Dr. Smith, who is now at Texas A&M Medical School, do a survey of the coastal counties in Texas and when I visited him in 1982 with Dr. Langmuir, he had examined maybe a hundred armadillos and 25% of them were positive. And this was out of the counties along the Gulf of Mexico extending from Louisiana as far south as Corpus Christi and maybe a county inland. And then he asked if we would cooperate with him in collecting armadillos and so forth, so we helped him for the next couple of years and the information just piled up that the armadillo was a highly susceptible animal and when they became infected, they were discharging enormous numbers of organisms. I never quite understood how leprosy was spread and Dr. Smith demonstrated to me the nasal exudates that they were just swarming with these vast organisms and he said, “You have like a bronchial pneumonia and they’re just coughing it up and contaminating the environment.”

And then besides that the musculature of the body was all contaminated and was being excreted from different orifices as well, the semen had it. It was just what you call a generalized infection.

So then beginning in 1982, the question came, “Does this have any influence on human disease?” I wasn’t the only one that had this question, but a number of dermatologists were looking at it. And last year in the *Annals of Internal Medicine* was the first valid reference publication stating that five out of seven armadillo handlers in Louisiana had become infected and that the only exposure they could identify would be armadillos.

Now, I have a study going this year with a medical student from Baylor who is also working on his MPH of evaluating 12 or so cases that have occurred in Texas of people with leprosy that are being treated at the clinic in Houston that’s maintained by the public health service and so far as I know at this time we’ve gotten reasonable history, not complete histories, on half these people and it looks like their source of infection was armadillos. Now, why this thing has not moved out of the original area where

armadillos were identified as being infected, that is Southwest Louisiana, it has not crossed the Mississippi River, it hasn't entered Alabama or Florida where the tropical zones are, nor has it moved out of the coastal area of Texas. Well, maybe the desert is too dry for the armadillos, I don't know enough about its characteristics but I know I have them in my back yard and down by the bayou. Right at this moment we have a lot of interest in this as possibly a new zoonotic disease and this more or less complements what I was saying earlier, we don't know what nature is cooking up all the time and what these organisms are striving for and new relations.

**Awhile back we did speak of Giardia. Well, a disease with a similar epidemiology transmission pattern, also an intestinal protozoan is cryptosporidiosis that was known to veterinarians or certainly known to parasitologists and a few veterinarians but now has become seen as a very important public health problem. Have you been involved at all with that?**

Yes. I remember about four years ago, 1983, just about the time that AIDS was becoming a problem of our big hospitals, the vice president of M.D. Andersen, Mr. Bob Hickey, corned me at a reception for another friend, Ganette, who was getting married and asked me, he says, "What is this protozoal disease of animals that are doing so much damage to our AIDS cases?"

Well, I was bewildered. I couldn't answer his question because I couldn't think in terms of what he was describing. He said, "These people lose an enormous amount of blood, they change their linen and there's blood all over the room, the nurses are scared stiff that they're AIDS, and logically so," and so forth. He said, "It's just playing havoc with our patients and with our staff who are afraid to handle them."

Well, I left that and went home thinking to myself, "Gosh, what are they talking about?" And I remember calling around and nobody really coming to any answer and I don't know if it was you here at CDC or somebody at CDC told me, "Yes, this was an invasion of the mucus membrane getting into the villi and causing erosion of the mucus membrane and extensive bleeding following."

Well, this one aroused my attention and then that summer I went to the AVMA meeting in New York and there was a seminar on cryptosporidium put on by the people at Cornell University and I was amazed that the room was just filled with practitioners. And I said to myself, "Gosh, this is one I certainly missed, I had no idea that cryptosporidia was so important."

And there was a whole morning session devoted to it in feedlot animals and the devastation it was causing. And then the following year the American Society of

Tropical Medicine had a special session devoted to cryptosporidia and naturally we have made questionnaires for the greater Houston area, surveys there. But outside of the big hospitals where it was a complication of AIDS I have not encountered any problem. But at the veterinary school they've had it pretty constant since 1984 and the autopsy laboratory had one outbreak where there was seven or eight veterinarians involved and I sent the summary of it to M&M report but they said this was so commonplace that it wasn't of any value for publication.

**Subsequently, we're now seeing community water borne outbreaks. It's an important agent in daycare centers although apparently not as frequent as Giardia.**

How is it treated?

**It is not treated, but in an immune-competent individuals it's self-limiting.**

Self limiting and those are...

**The problem with the AIDS patient is that it is not self-limiting and there's no drug that will arrest the—**

Another part that I don't understand is the cryptosporidia is the genes but what do they call the species?

**Well, I think most investigators are not really touching on that question at this point because ....—**

There's not enough difference to .....—

**....it's really going back to the drawing boards and learning more about the organism before one designates a particular species.**

Well, certainly the outbreak—

**The species cross-transmission is quite easily demonstrable.**

In dogs and cats and cattle.

**Well, I'm mainly thinking of the strains from cattle and foals and sheep can be transmitted to mice and to people epidemiologically, we've seen that.**

Another one I have curiosity about is *Pneumocystis carinii*. Is this the organism that comes from rodents or this one found in humans, is that different?

**There's no evidence that it's different.**

No evidence that it's different.

**Right. This appears to be an organism which is almost ubiquitous and there's a lot to be learned yet about transmission, but there's no good evidence that the sort of prevailing information would suggest that almost everybody is exposed and there's a very high rate of carriage of this organism, and again, stress and a variety of forms of immunosuppression result in a proliferation of the organism in the lung.**

So you're saying this is every place and many of us are actually carrying it at different times in our life and it's only when we come under severe stress that it may manifest itself. The other way it manifests is in leukemia patients, isn't it?

**That's right. Prior to AIDS we were—in the United States this was almost entirely a disease of people, cancer patients, who were immunosuppressed as a result of treatment. And it was also a similar disease but in a different epidemiologic form was seen in Europe in orphanages in children that were heavily stressed and malnourished under those circumstances.**

Talking about other parasites, why don't we see trichinae in our AIDS patients, or don't we have enough trichinae around? I haven't heard of any reports of trichinae being a complication of AIDS.

**Well, certainly trichinae would be one of the organisms that one could potentially see as being a problem in AIDS patients because the organism has an ability to reproduce for variable but occasionally extended periods of time in the infected person's intestine. Now, whether or not the transmission rate in this country of trichinae is so slow that perhaps it has not been observed in AIDS patients, or whether or not the particular mechanism of the immunosuppression does not give advantage to that. That appears to be the case with Strongyloides which is one of the few helminth diseases in which reproduction, asexual reproduction, occurs in the hose and that classically, the disseminated strongyloidiasis is seen in patients immunosuppressed with corticosteroids. That has not been observed in AIDS patients and indeed it has been removed as one of the opportunistic infections which forms part of the definition of the AIDS syndrome. But that's been eliminated now for the last three years.**

Have we reached a point now with trichinae that we say we've really got it under control?

**Trichinae is controlled. It still occurs and this still has to be defined as a public health problem of sorts, but as you know, when you started working in public health it was a true public health problem in the United States with 300-400 cases every year and maybe 10-15 deaths. In the last five years the number of cases diagnosed and reported in the U.S. has been less than 50. We see a fatality every other year, and this of course has been without any specific control problem aimed at trichinae. It would appear that education to the point that every housewife in this country has been taught that they have to cook pork thoroughly and even if they don't know why, they're aware that there's something in pork that needs to be cooked. The other thing is of course, and I remember you lecturing to me when I was a veterinary student talking about the effect of home freezers and the effect that this had, and it certainly has. A good bit of pork served in the United States has been frozen and if it's frozen for long enough, that will destroy trichinae that might be there. But trichinae is still endemic in the swine population and recent studies have clearly shown the regionality of the problem such that if we're talking about a national rate of trichinae prevalence in pigs of roughly one per thousand marketed hogs, it's 6, 7, 8, 9, 10 times that rate in Pennsylvania and New Jersey, some other middle Atlantic states and the New England states, mainly associated with a small backyard producer who keeps a few pigs around, may feed them waste but perhaps more importantly from the point of view of maintaining transmission does not remove carcasses after a pig has died so that cannibalism occurs, there's rats which maintain a cycle of trichinosis commensally with the pigs.**

Do you see the need for any ELISA testing in the United States for examining all our 90 million pigs that go to slaughter?

**Certainly it would be the way of—I see it in two ways. One, the technology has reached the point where there's an accuracy to these tests that would completely eliminate the public health problem. One could assume that with proper application of ELISA screening in plants, one could for all practical purposes prevent transmission of trichinae to pigs through commercial pigs. But I think more importantly it could be used as an epidemiologic tool for identifying problem herds and then eliminating them.**

How about the ELISA in teniasis of pork, swine and beef animals?

**Although the objective of developing a serologic test for detecting infected cattle has been an objective, we haven't really made any practical progress. We do now have very good tests for cysticercosis in human beings which is finding application for the imported disease in the southwestern United States. And Jim, I can see that we've got to wind up, so—**

Well, our wind up will say that your generation and the generation that follows you I'm sure will have problems that are just as engaging as they were to us.

**Thank you.**



*Dr. James Steele, 1989. Photo from DVD of interview.*